

## WOUNDS OF THE BLADDER IN OPERATIONS FOR HERNIA.<sup>1</sup>

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IN 1769 Verdier published his treatise on hernia of the urinary bladder, and so thoroughly and scientifically was his work performed that it still remains one of the classics of this subject, no later writer having been able to discover any cases occurring up to his time which Verdier had overlooked. From that date to the present this variety of hernia has been considered a rarity, and hence of little practical interest, but within the last few years numerous cases in which the bladder has been wounded during the operation for radical cure of hernia have been recorded, and I have been able to find thirty-four cases in the literature and to add to them eight unpublished cases which have occurred in New York. The reason for the great increase in the frequency of this accident is undoubtedly to be sought in the altered methods of operating for hernia. In the old operation of herniotomy, consisting of a simple *débridement* or incision of the hernial ring, the bladder was not exposed to injury even if it were prolapsed, and was not likely to be discovered unless it were injured or were very conspicuous. But the attempt to effect a radical cure, now made even in cases operated upon primarily because they are strangulated, necessitates complete dissection of the neck of the sac at least in order to ligate it, and if the hernia is in close relation with the bladder, the latter is more likely to be discovered even if not wounded.

<sup>1</sup> Read before the New York Surgical Society, February 27, 1895.

It may at first seem strange that such a thick-walled, fleshy organ, with its evident muscular structure, could be injured unwittingly even by the careless, but as a matter of fact the protruding portion of the bladder is generally so attenuated and altered that its recognition has sometimes been a matter of difficulty even after it has been opened and the surgeon has passed his finger into it. It is, moreover, frequently enveloped in a mass of fat which completely conceals its true nature. There is, therefore, small blame to be attached to those surgeons who have injured it in the past, although the few who have recognized it in time to avoid injury are certainly deserving of praise. But while this is true of the past, it is probable that in the future the accident will be less frequent, now that the subject has been more thoroughly studied, and the surgeon has been put upon his guard and warned of signs of danger which will enable him to make his diagnosis in time.

The most important of recent contributions to the subject have been those of Aue, Lejars, and Ostermayer, very little having been written upon this accident in English, except the reporting of some clinical cases. The case which first aroused my interest in this subject was the following:

CASE I.—On August 16, 1893, there was admitted to St. Luke's Hospital a tall, thin, Irish working-man, aged sixty-two years, with very soft and flabby muscles, suffering from an oblique inguinal and small femoral hernia of the right side. Five years previously, while lifting a heavy iron rail, he felt something give way in his right groin, and four or five weeks later a lump appeared at this spot. He never wore a truss, but nine months ago was operated upon in one of the hospitals of this city for radical cure. Within two months the hernia returned, and for five months after its reappearance he wore a truss, but the latter was so inefficient and caused so much discomfort that for two months he had been unable to wear it, and he begged to have something done for his relief. The inguinal hernia was reducible, not of large size, but with a very large canal, and the small femoral hernia was also reducible. A scar remained from the former operation, but it was impossible to say what method had been employed in that case. The patient gave no unusual symptoms; above all, nothing to attract attention to the bladder, and the urine was normal.

August 22, under ether anæsthesia, I undertook the operation for radical cure. The incision was made on the inner side of the old scar, parallel with Poupart's ligament, exposing the sac of the inguinal hernia, and then another incision was made passing downward from the middle of the first, so as to expose the femoral sac. The latter was dissected out, freed up beyond its neck, folded up according to Macewen's method, and secured within the ring by a stitch passing above Poupart's ligament. The femoral ring was closed with three buried purse-string sutures of silkworm gut, as is my custom, each one covering in the preceding. The inguinal sac was then dissected out with some difficulty as it was adherent to the scar, incised, and the ring and canal were found widely open. The sac was empty. When its neck had been reached and was being separated from the margins of the internal ring, I noticed what seemed to be a second sac, projecting to the inner side of the first when the patient strained during some disturbance in the anæsthesia. This structure was drawn out and examined carefully, the possibility of bladder presenting in this way being in my mind at the time. The sac was pale in color, almost white, as thin as an ordinary hernial sac—in fact much thinner than many, and evidently contained fluid. It was not intraperitoneal, and feeling inside of the abdomen I did not detect any pedicle leading to the bladder. I was still suspicious, but imagined that it must be the old hernial sac, perhaps shut off from the peritoneal cavity at the first operation, and converted into a hydrocele of the sac. The opening in the peritoneal cavity was carefully protected with gauze, and an incision about an inch in length was made in the sac, which gave issue to a clear yellow fluid which was recognized as urine.

Even when the sac was open it was almost impossible to recognize either muscular tissue or mucous membrane, so thinned out and altered were the tissues of the organ, but an instrument passed into its cavity clearly entered the bladder and touched another introduced by the urethra, and without passing through any narrow neck as if the sac was formed of a diverticulum. The wound in the bladder, which would readily admit the finger, was closed at once with three tiers of fine silk sutures, not including the mucous membrane, and placed very close together. After a thorough cleansing the inguinal sac was stripped up with some difficulty from the bladder (although it was not so adherent to it as I had supposed would be the case) and sutured close to its neck with a continuous catgut suture, a ligature

seeming inadvisable because of the proximity of the bladder. The conjoined tendon was then stitched with buried silkworm-gut sutures to Poupart's ligament, leaving the cord in the lower angle of the canal as in Macewen's method. A strip of gauze was inserted into the angle near the cord, and another at the lower end of the femoral branch of the skin incision, the skin and fascia were united, and the usual sterilized gauze dressings applied.

The patient suffered considerable pain for three days until his bowels moved, and the temperature reached  $101^{\circ}$  F. on the first day after the operation, then running for a week from  $99^{\circ}$  to  $100^{\circ}$  F., but the wound healed by primary union except at the angles where the small gauze drains lay. There was no discharge except a little serum, and the drains were removed in a week. No sinus formed, and the wound was completely healed by September 11. The patient was directed to empty the bladder every two hours for a day or two after the operation (and a catheter had to be employed perhaps a couple of times), but he had no bladder symptoms. He was discharged with a perfectly solid scar on October 2, but unfortunately I have been unable to follow him since.

I am indebted to Drs. Robert F. Weir, William T. Bull, Lewis A. Stimson, Frank Hartley, Arpad G. Gerster, and Lucius P. Hotchkiss, all of this city, for the following unpublished cases:

CASE II.—F. P., blacksmith; German; married; aged fifty-three years, admitted to New York Hospital December 2, 1891. For fifteen years he had had on the right side, and for one year on the left, reducible inguinal herniæ, for which he wore a truss. He never complained of any urinary symptoms. The patient was very fat and flabby. The right hernia was tympanitic; the left dull on percussion. The right inguinal canal admitted three fingers; that of the left side was smaller.

December 7, Dr. Weir operated for radical cure upon both sides. That upon the right was easily dealt with. On the left the incision was five inches in length. The aponeurosis of the external oblique was incised, opening up the inguinal canal freely to the internal ring. A small sac was found, dissected out, and then transfixed at the neck and ligated with catgut. A small mass of extraperitoneal fat presenting in the wound was ligated and cut away. A similar elongated fatty mass was treated in the same manner, but it became evident in

cutting this off that a cavity had been opened and some urine escaped. The ligature was removed, and exploration with the finger introduced into the cavity showed that the bladder had been wounded. A continuous catgut suture was applied to the mucous membrane, and a tier of interrupted fine silk sutures introduced like Lembert's sutures outside of this. Three "Macewen" sutures were applied to the posterior wall of the inguinal canal, its lower angle being drained with a strip of gauze, the fascia being united over the cord above. A catheter was introduced into the bladder and kept in place for three days.

The wound was dressed on the second day, and there was a slight odor of urine, and on the following day the skin was decidedly reddened by that secretion. A sinus formed, but on January 1 the urinary odor had disappeared, although the sinus did not close until three or four weeks later. The patient ran a high temperature for two or three days, 103° F. at the highest, but no abscesses formed, and the wound healed without serious complications.

CASE III.—A banker, forty-five years of age, had had a left scrotal epiplocele which had been irreducible for several months, and had been treated by a truss, but the latter had caused discomfort. In 1893 Dr. Bull operated for a radical cure. The abdominal walls were very thick. In separating the spermatic cord from its enveloping layers it was noticed that the subperitoneal fat was also unusually abundant. The sac contained omentum and was reduced by slight pressure before the incision was made. What appeared to be the sac of a direct hernia was dissected out, ligated, and cut away, considerable fluid (urine) appearing, but the latter was thought to have been due to the irritation of the sac by the pressure of the truss. Before ligating the sac, the finger had been passed into it, and appeared to enter the peritoneal cavity. In the subsequent preparation of the inguinal canal for suture, the true hernial sac was found protruding through the internal ring, having been previously overlooked by reason of the great thickness of the abdominal walls and subperitoneal fat. This sac was treated as usual and the canal closed according to Bassini's method, the external wound being sutured without a drain. After the operation was concluded, it was considered probable that the first sac had been the urinary bladder, and this was soon proved to be the case by frequent micturition, tenesmus, and hæmaturia, so the following day the wound was partially opened opposite the external ring, and a gauze drain inserted. The wound healed, however, by first intention in two and a half weeks, with no leakage of urine,

and with only trifling constitutional disturbance. At the end of one year there was no relapse.

CASE IV.—A man, seventy years old, with an immense, irreducible, left inguinal hernia, was operated upon by Dr. Stimson, September 20, 1894. The sac contained the greatly hypertrophied sigmoid flexure, which could not be reduced on account of its size, so it was resected, and sutured. In dissecting the parts the bladder was very slightly nicked, although its presence had already been noticed. Some urine escaped. The minute opening was closed by a single suture. The patient died in forty-eight hours, from causes dependent upon the major operation, without reference to the wound in the bladder.

CASE V.—A man, about forty years of age, with an old oblique inguinal strangulated hernia of the left side, was operated upon by Dr. Hartley in 1890. The sac contained small intestine and omentum, which was easily reduced at the operation, and it was proposed to perform a "radical cure." The bladder was recognized and separated from the sac, being known by its thickness and position. It lay extraperitoneally. The sac was ligated and cut away, and the bladder must have been injured at this time from being imperfectly held out of the way, but exactly how the accident occurred is unknown, the wound not being recognized at the time. The bladder was probably included in the ligature of the sac and cut or torn during the removal of the latter. The wound was closed, but on the occurrence of hæmaturia, two hours later, it was reopened, clots were found in the extraperitoneal space near the bladder, and an extraperitoneal wound in the latter was found and sutured. The patient died of shock and loss of blood.

CASE VI.<sup>1</sup>—Nathan S., seventy-six years of age, with a very large strangulated left inguinal hernia, was operated upon in private by Dr. Gerster, March 16, 1893. After reduction of the hernia and extirpation of the sac, a yellow, lipomatous but fluctuating tumor was observed closely attached to the spermatic cord, with a pedicle running into the abdominal cavity. It was incised, in the conviction that it was a præperitoneal lipoma, a cavity opened, urine escaped, and exploration with the finger proved that it was the bladder. The wound in the bladder was closed with three tiers of catgut sutures, and the organ reduced. The ring was not closed, but drained, the

<sup>1</sup> Cases VI, VII, and VIII were reported in the discussion of the New York Surgical Society.

external wound being partly closed by sutures. An uninterrupted recovery was made, and the patient now wears a truss. An attempt at permanent catheter-drainage was made, but the patient would not keep the instrument in place.

CASE VII.—Joseph P., forty-seven years of age, was operated upon by Dr. Gerster at Mt. Sinai Hospital, November 14, 1893, for a strangulated left inguinal hernia of large size. The bladder was recognized, but during the "radical" part of the operation, in dissecting away a mass of fat closely adherent to the sac, the organ was wounded, and urine escaped. The wound was immediately closed by suture as in the last case, and the hernial sac extirpated. The inguinal canal was also left open in this case. November 16, there was high fever, delirium, and abdominal pain. November 18, urine escaped from the wound, and all the symptoms improved. Permanent catheterism was successfully employed in this case. The leakage of urine continued until the middle of December, and on January 19 the patient was discharged with a truss.

CASE VIII.—A man, fifty-four years of age, with a reducible left inguinal hernia, was operated upon, January 24, 1895, at Bellevue Hospital, by Dr. Hotchkiss for a radical cure. The sac was dissected out, ligated, and removed. What appeared to be a mass of loose adipose tissue was ligated and cut away, but it became evident in doing so that a cavity had been opened, although the extreme thinness of the walls and the serous appearance of the lining made the surgeon think he had only accidentally discovered a second hernial sac, or, perhaps, a diverticulum of the first, so the wound was closed, the canal being dealt with according to Bassini's method. Twenty-four hours later, it being evident that the bladder had been injured, the wound was reopened and enlarged upward, revealing an opening of considerable size in the extraperitoneal part of the bladder, and a large amount of blood-clot in its neighborhood, the ligature having evidently slipped. The vesical wound was closed by sutures, but the patient died of shock and loss of blood in nine hours, having passed no urine.

*Anatomy.*—The bladder may be involved in hernia in at least three different ways. First and most common is the prolapse of a portion of the organ which is entirely extraperitoneal, thirty-four (two-thirds) of my fifty-one cases being of this variety, but in three of them the protrusion took place through small abnor-

mal openings in the abdominal wall just internal to the external ring, and not through the inguinal or femoral canals. I have included these three cases, however, with the rest, because their other characteristics are so similar that it is usually impossible to distinguish them clinically, especially as there may be an inguinal hernia associated with them and closely adherent. It is important to distinguish between those cases in which the bladder alone is present (Fig. 1), and those in which there is also a hernial sac containing bowel or omentum (Fig. 2). The latter

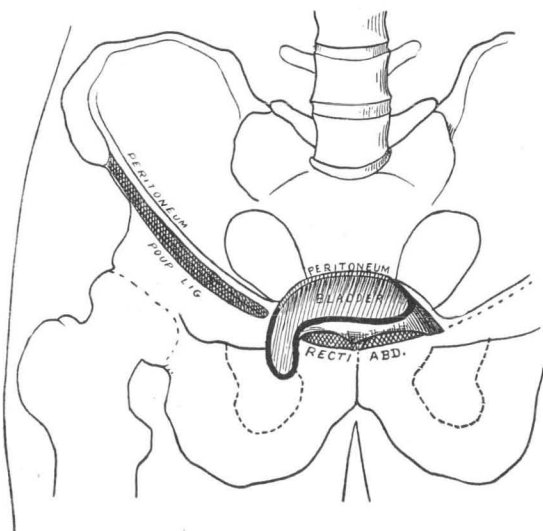


FIG. 1.—Hernia of extraperitoneal portion of bladder.

are perhaps most likely to come to operation, but the risk of accidental wounds is much greater in the former, as the operator will find only one sac and be more likely to open it at once, supposing it to be the hernial sac. Of the thirty-four extraperitoneal cases, about two-thirds (twenty-three cases) were complicated with other herniæ.

Rarest of all is the true intraperitoneal form (Fig. 3), only four such cases being found. This appears least likely to be injured, as all of these cases were recognized in time and reduced without accident. The third variety (Fig. 4), of which I have



only thirteen cases, is, nevertheless, very important, owing to the great danger of wounds being inflicted upon the bladder, even when it has been previously recognized, should it present in this way. In this form both the extra- and intraperitoneal portions of the bladder are involved, the intraperitoneal portion forming actually a part of the wall of an accompanying hernial sac, usually lying posteriorly. The double danger of the condition lies in the likelihood, on the one hand, that the surgeon will reduce the contents of the sac, dissect out the latter, and ligate and cut

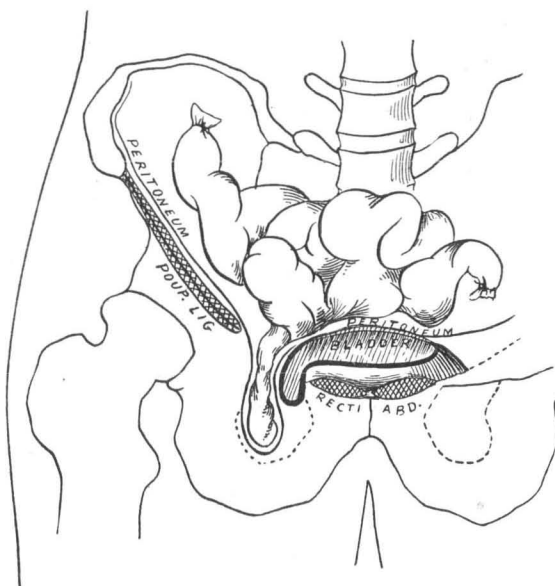


FIG. 2.—Hernia of extraperitoneal portion of bladder associated with hernia of bowel.

it away, including a portion of the bladder, without recognizing the organ, or that, on the other, he will injure it even after having recognized it in trying to separate it from the sac before ligation of the latter.

The diagrams illustrate the different varieties of vesical hernia. In them the bones of the pelvis are represented in outline, and it is supposed that the abdominal walls have been entirely cut away along the crest of the ilium, Poupart's ligaments, and the pubis, the section also laying open the inguinal canal.

The anterior part of the hernial sac has been cut away so as to expose its contents, and the bladder has been laid open by an incision entirely removing part of the fundus, as well as the anterior part of the wall of the prolapsed portion as if it had been cut off after dilating the organ and freezing it. Where the section passes through the extraperitoneal portion of the organ, its cut edge is represented by a solid line, and where it invades the intraperitoneal part, the cut edge is drawn with a striated line. The cut edge of the peritoneum can easily be traced in all the

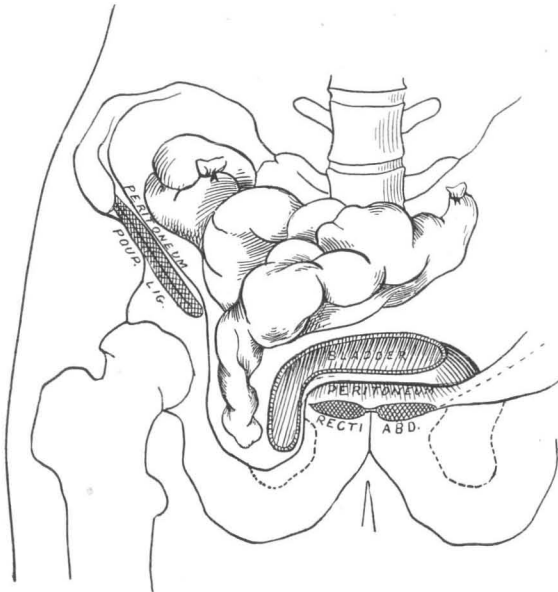


FIG. 3.—Hernia of intraperitoneal portion of bladder.

figures along the abdominal parietes, across the fundus of the bladder, and down into the hernial sac.

It has generally been supposed that the bladder is very rarely present in femoral hernia, but if we take into consideration the proportions of inguinal and femoral hernia (according to Macready, there are 92 per cent. inguinal to 8 per cent. femoral) the contrary will be seen to be the case, for of the fifty-five cases in my collection, ten, or nearly one-fifth, are of the femoral variety, against forty-five inguinal, proving that femoral hernia

involves the bladder in a larger proportion of cases than inguinal. There is, however, one element which requires notice—namely, the fact that as the proportion of femoral herniæ coming to operation for strangulation is much larger than that of inguinal (in 100 cases of operations for strangulated hernia, 42 per cent. were inguinal, and 58 per cent. were femoral, according to Macready), and as fully one-half of my cases were strangulated, it is to be expected that a larger number would be of the femoral variety than is usually the case.

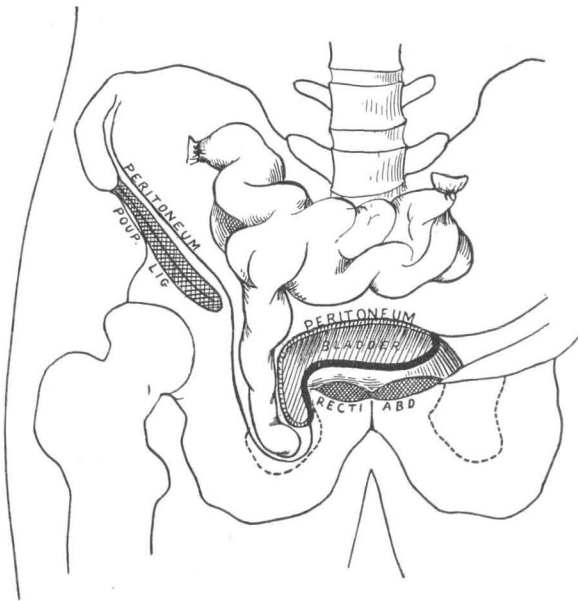


FIG. 4.—Hernia of both intra- and extraperitoneal portions of bladder.

Except to note that the bladder occasionally protrudes in perineal and ventral herniæ, and that there is one rare instance on record in which it was found in a sacro-sciatic hernia, we need not consider the other varieties which are foreign to our subject.

As will be shown later, the walls of the protruded part are much altered. The protrusion is often spoken of as a diverticulum, but as a rule it consists merely of a very much elongated

portion of the bladder, seldom with any narrowing of the neck, and it is probably always made by the traction of the hernia, and does not consist in a true diverticulum, which was originally free and has become engaged in a hernia. Pott's famous case, in which he found a stone in an extraperitoneal protrusion of the bladder in the groin, with a very narrow neck, was of eight years' duration, and the narrowing was undoubtedly due to late changes. Pilz and Lane found similar diverticula, but in Pilz's case it was covered in part at least with peritoneum.

*Etiology.*—As to the causes which lead to the formation of hernia of the bladder but little is known, except those general facts which apply to all forms of hernia. The proportion of the sexes is slightly different from the ordinary figures, being as follows in my cases: inguinal, thirty-seven males to six females; femoral, five of each sex, showing an increased proportion of women, and also of femoral hernia. Vesical hernia appears to be a peculiarity of advanced years, and, perhaps, we should add of old herniæ, for of forty-five cases in which the age is known, nearly one-third were over sixty years, and two-thirds were over fifty at the time of operation. But Krönlein's case occurred in a boy of five years, and in Pott's case, operated upon at thirteen years of age, the hernia had also been first noticed at the age of five.

The most generally favored theory for explaining the descent of the bladder ascribes it to the traction exerted by some mass of extraperitoneal fat, designated by the French by a special name, "lipocèle,"—the well-known theory advanced by Cloquet and Roser, to go no further back. It is certainly true that such lipocèles have been found in many of the recorded cases attached to the bladder (according to Lejars in eleven cases out of eighteen in which the description is complete enough to allow of drawing deductions), and the fatty tumor has often been the cause of the accidents to the bladder. In many cases, however, it seems probable that that organ has been drawn out of the abdomen by the peritoneum of the hernial sac, just as the cæcum or sigmoid flexure is often pulled down. One other factor which deserves attention is the frequent occurrence of the bladder in her-

niæ which have relapsed after attempts at radical cure, as was the case with my patient, causing me to notice their relation; and I was interested afterwards to find that Lanz was inclined to explain his case in the same way. In the operations for radical cure it is customary to pull the sac well down when ligating it in order to secure a smooth internal surface for the peritoneal cavity, and this traction not only brings the risk of including the bladder in the ligature, but would certainly predispose it to descend if that part of the peritoneum were further drawn upon to make a sac for the recurrent hernia.

The intraperitoneal variety of vesical hernia can be explained by the ordinary causes of hernia, provided the organ be dilated and flabby. Habitual constipation would predispose to the protrusion, for a rectum distended with fæces would lift the bladder out of the pelvis just as Petersen's rectal bag employed in the operation of suprapubic cystotomy elevates it, and by thus bringing it to the level of the hernial apertures would render its prolapse more likely to occur.

*Diagnosis.*—Important as it is to be able to recognize the bladder before the operation, the diagnosis will rarely be made so early. Occasionally, however, the surgeon may be fortunate enough to find symptoms which will awaken a suspicion on his part—such as vague difficulties in urination, passing attacks of retention, often accompanied by painful vesical tenesmus, these attacks being relieved in some cases by assuming some peculiar position, as by lying down, or hanging by the knees over the end of a bed, and in others by pressure upon the swelling in the groin or scrotum, the patient having discovered in these cases that the tumor increases in size when retention sets in. Occasionally he may learn that urination sometimes takes place in two acts, the bladder first emptying itself, and the hernial pouch somewhat later. The urine may show signs of vesical inflammation, or may remain perfectly healthy. If strangulation occurs, it may be marked by less intense intestinal symptoms, resembling those of strangulation of a Littré hernia, or it may be accompanied by decided uræmic signs and vesical tenesmus. But ordinarily there will be no difference from the usual typical clinical picture of strangulated hernia of intestine or omentum.

The physical examination itself will rarely give a clue to the condition, although in a few cases it may do so by the evident fluid contents of the tumor, its rapid disappearance when the patient lies down (like the flow of serum from an otherwise empty hernial sac associated with ascites), the inability of a truss to prevent descent of the hernia, and the causation of a desire to urinate or even of an immediate and uncontrollable evacuation of the bladder by pressure upon the sac. Palpation after the reduction of the greater part of the hernia may reveal a small, flat, doughy tumor feeling like a thickened sac or like a flattened piece of adherent omentum, and whenever this is felt the presence of a hernia of the bladder should be suspected, and every means of exploration employed to settle the diagnosis. The means of exploration are naturally the introduction of a large curved sound (Mercier's prostatic catheter has a long beak which is particularly suited for this purpose), trying to bring its point up to the neck of the sac, or to make it enter that cavity, or the injection of considerable quantities of fluid or air into the bladder while watching the effect upon the tumor. A negative result of this examination does not disprove the existence of a vesical hernia, for the opening between the prolapsed part of the bladder and its main cavity may be entirely closed by external pressure, or by inflammatory thickening of its walls and obstruction of its lumen.

Often the diagnosis will first be made during the operation, and it is worth while to emphasize the points which will aid to it before the bladder has been injured. One of the most constant indications is an unusual quantity or quality of the fat surrounding the hernia—the lipocoele already alluded to. Sometimes a bulky mass of fat is found, a true lipoma, sometimes only a thick layer of subperitoneal fat. The fat will often attract attention by its having apparently a thin membranous covering or sac of its own, but when this thin cellular envelope is opened it will be found to be attached by septa to the fat, so that the latter does not shell out as readily as the ordinary hernial sac, and, moreover, in working down through the fat the surgeon will come down upon the bladder and find the fat closely adherent to it. This peculiar

double attachment of the fat to both of these apparent sacs should especially put the surgeon on his guard, warning him that in the first place he is not merely enucleating adherent omentum from a very thin sac, and in the second place when he reaches the bladder that he has not found an ordinary sac, which he can readily strip out of the extraperitoneal fat.

The appearance of the bladder itself is very deceptive, for although its muscular fibres will sometimes be well marked and easily recognized, in the majority of cases the wall is so attenuated that the muscle forms a thin coating resembling the cremaster, and it may even be totally unrecognizable as muscle. In my own case and in many others recorded, the wall of the bladder was so thin and transparent that it resembled an ordinary hernial sac, and it was only by the odor of the urine that it could be recognized even after it had been opened; in fact, in many cases it has been ligated and cut away, and the diagnosis has not been made, even after examination of the resected portion. Reverdin was compelled to have the tissue removed, examined microscopically in order to satisfy his doubts in one case, so closely did it resemble the peritoneum of a hernial sac. If the prolapsed bladder forms part of the sac wall of an ordinary hernia (as in the combined extra- and intraperitoneal form of protrusion) it may be overlooked, being considered merely a thickened patch in the wall of the sac. To show the real difficulty of recognizing the bladder, one needs only to glance at the following list of structures for which it has been taken. In fifty-seven cases collected by me the bladder has been recognized in twenty-three cases before injury, in four it was not seen until it was wounded, in two it was not seen at all during the operation, in ten cases it was taken for the hernial sac, in four for a second hernial sac, in five for a tumor or cyst, in three for a thickened patch in the sac wall, in three for properitoneal fat, in one for degenerated omentum, and in one for a haustrum of the colon.

When the bladder has been recognized before it is injured (and it has generally been recognized thus by surgeons who have already once seen the organ wounded), the suspicions of the sur-

geon have been usually awakened by the peculiarities of the fatty deposits already described, or by the muscular fibres, or, finally, by the relation of the spermatic cord which, instead of lying behind or being spread out over the surface of the tumor, as in the ordinary hernial sac, lay in front of it. These suspicions have been confirmed by tracing the pedicle into the abdominal cavity (and there should be no hesitation in enlarging the wound for this purpose), and finding it to lead downward behind the pubic bone, or by injecting fluid into the bladder and finding that it filled the prolapsed portion, or by introducing a sound into the urethra, and feeling it in the sac, or at least approaching its pedicle in the pelvis.

Even when the bladder has been opened, it is not always easy to demonstrate the fact, although the appearance of the urine has generally done so. In other cases the proof of the accident has been obtained by passing a sound, or by making injections into the bladder by the urethra. When the injury has not been recognized at the time of operation it has generally shown itself later by the formation of a urinary fistula in the wound, sometimes as late as the tenth day, by vesical tenesmus and hæmaturia, or, in a few cases, by the development of peritonitis. Occasionally the subsequent examination of the tissue removed has been the proof of the nature of the injury.

*Wounds.*—The injuries inflicted upon the bladder have been very various in character and extent. In some cases the bladder has been incised, generally in an exploratory and cautious manner, something unusual in its appearance having put the surgeon partially on his guard. In others it has been boldly cut away after ligation. In a considerable number of cases it has been torn by the finger in trying to separate the hernial sac from it. In two cases the wounds have been needle punctures. In a case of this kind reported by Roth, a patient who had been operated upon for the radical cure of hernia died from other causes a few days after the operation, and it was found at the autopsy that the sutures placed in the inguinal canal had included the wall of the bladder, but had not penetrated its entire thickness. Probably there would have been no evil consequences to this accident.



Keetley<sup>1</sup> reports that in a similar operation he had accidentally wounded the bladder with the point of his needle, but had discovered it at once, and, closing it with sutures, had obtained primary union. Halsted<sup>2</sup> operated for the cure of a large reducible inguinal hernia in a man, forty-eight years of age, by his method on August 16, 1889, and ten days later urine escaped by the wound. In nine days the flow ceased and the sinus closed, the patient recovering. As Halsted sutures the sac before cutting it away, instead of applying a ligature, it seems probable that the bladder must have been wounded (as he suggests himself) in passing the sutures intended to close the inguinal canal. The size of the wound has varied from these needle punctures up to an opening which would admit two fingers.

*Treatment.*—When the bladder has been recognized before it has been injured it should, of course, be freed and reduced, the ring being closed as usual by sutures. But in some cases it will be found difficult to dissect the bladder from the surrounding parts, and in such cases it is wise to abstain from any attempt at radical cure, and to leave the pouch *in situ*, especially as the subjects are apt to be old and are often in poor condition, owing to the existing strangulation of the hernia. If a distinct diverticulum is found, however, it is probably best to resect it, closing the opening in the bladder with sutures, rather than to return such a long pouch into the abdomen, but it must be remembered that true diverticula are uncommon, although the prolapsed portion often resembles them when first discovered. As a rule, it regains its elasticity when dissected free. I have found seventeen cases recognized and treated without injury, three of which terminated fatally, and in one case the result is not recorded (Walther). Death, however, was never due to the bladder complication. In eight cases (and probably others in which this point is not mentioned in the reports) the hernial opening was closed by sutures. In two or three cases no attempt was made to reduce the prolapsed bladder or effect a radical cure. All of the purely intra-peritoneal cases belonged to this category, with one death and one unknown result.

<sup>1</sup> Lancet, 1894, 1, 1068.

<sup>2</sup> Johns Hopkins Hospital Bulletin, 1890, 1, p. 13.

When the bladder has been wounded, there is a choice of three methods of treatment, the open method, ligature, and suture. The open method leads inevitably to the formation of a fistula, and should only be employed where there is a great danger of infection from such accidental complications as sloughing of the hernia or very foul urine. Of eight cases in my table, death followed the operation in three, being due in one case to a pre-existing pyelonephritis, and in another to some intestinal cause, not to the injury to the bladder.

The ligature has been applied and left *in situ* in eleven cases, of which three died, all who recovered having a sinus, except Bull's case. In two cases (and, perhaps, Hartley's case should also be included) the ligature slipped off, necessitating a secondary operation which terminated fatally in one case (and also in Hartley's). The fatal case was that of Hotchkiss, related elsewhere. Jungengel saved his patient, operating forty-eight hours after the primary operation, and closing the bladder wound with sutures. In another case (Michel) the surgeon reopened the wound in twenty-four hours, removed the ligature, and sutured the vesical opening, the patient making a good recovery. These results are not so bad but that if suture be impossible (from lack of material, necessity for hurry, or any other pressing reason) the ligature might be considered as a means of occluding the wound in the bladder in case of emergency, for if it can be made to hold by transfixion, its use will tide the patient over the early dangers of extravasation, provided the external wound be treated openly by packing, or, at least drained by a large tube carried down to the neighborhood of the vesical wound.

But, unquestionably, a suture should be made if it is in any way possible. Whether silk or fine catgut is employed seems to be a matter of indifference, but the sutures should not penetrate the mucous membrane; they should be placed very close together, ten or twelve to the inch, and there should be at least two layers, and by preference three. The method which gave such excellent results in my own case appears to be the best, the stitches of the first tier passing through everything but the mucous membrane and holding the divided muscular layer firmly together. The

second tier of sutures were passed like Lembert's sutures of the intestine, turning in the first set slightly, and a third set, not so closely placed but passed in the same way, rolled in and brought into contact still broader surfaces. This method has done me good service in suturing the bladder after suprapubic section. Before attempting to close the wound in the bladder all sloughing, lacerated, or crushed tissues must be cut away so that the edges of the wound shall be of sound material. The danger of making the sutures penetrate the entire thickness of the wall lies in the liability to the formation of calculi, which has been observed to take place upon the knots of thread or even of catgut when exposed in the bladder or dropping into it. If desired, a test of the tightness of the closure can be made by injecting the organ.

The external wound must be drained in some way, and, usually, this can be done by carrying a plug of gauze down to the wound in the bladder. If a radical cure is attempted, it would seem to be wiser in such cases to insert the sutures closing the inguinal canal according to Macewen's rather than according to Bassini's method, for the latter closes everything up to the level of the internal ring, so that in case of any real necessity for drainage on account of leaking of urine, the fluid would have to find its way out by a long and tortuous route. In Macewen's method the cord lies close to the pubis and a small drain could be carried through the opening left for the cord without interfering with the radical cure, and yet it would act promptly and efficiently in case of accident.

It is doubtful whether permanent catheter drainage of the bladder assists at all in securing primary union of the vesical wound, and as it adds an element of danger it would perhaps be better not to employ it. Of the cases in my table there were fifteen recoveries after primary suture, and one case which lived long enough to secure primary union of the vesical wound, besides two recoveries after secondary suture, making a total of eighteen cases. Permanent catheterization was employed in ten cases, including both secondary operations, and a sinus formed in four of them, one being a secondary operation. In eight cases

the bladder was not drained and a sinus formed in two of these, showing rather better results than when a catheter was left in the bladder. Of course the figures are not large, but I think we can conclude from them that it is safe to dispense with drainage of the bladder, and merely direct the patient to urinate every two hours for two or three days after the operation, and if retention should occur, the catheter should be passed at the same intervals.

From the figures just given it will be seen that primary union of the vesical wound was obtained in twelve out of eighteen cases, or two-thirds of the cases treated by suture, not including Keetley's successful case of needle puncture. When sinuses form, they usually close spontaneously, but I have been unable to demonstrate any marked difference between the fistulæ which result from open treatment, from the use of the ligature, or from suture of the opening in the bladder. Plater's case (from the sixteenth century) resulted in a permanent opening. Purcell closed the sinus in his patient by a plastic operation two months after the primary operation. All the rest closed spontaneously. In thirteen cases in which the duration of the sinus is known, two ran for four months, three for two months, four for one month, one for two weeks, and three from five to "a few" days.

*Mortality.*—Of the cases treated by primary suture, twenty in all (not including Keetley's case) four died (two from causes not connected with the bladder wound), and in one case the result is not known. Of the four cases treated by secondary suture, two succumbed to hæmorrhage and shock, the others recovered. The mortality of the entire series of forty-one cases in which the bladder was injured (including Keetley's and Halsted's cases) was about 25 per cent. (eleven cases), and appears to have no relation to the method of treatment. In only eight cases at the most can it be said that the vesical wound was even indirectly the cause of death. This is the more apparent when it is recalled that there were three deaths among the seventeen cases in which the bladder was exposed and not injured. The high mortality in both is undoubtedly due to the advanced

age of the patients, and to the frequency with which the hernia was strangulated, and also to the fact that many of the operations antedate the introduction of modern surgical methods.

Jaboulay and Villard<sup>1</sup> report three inguinal and one femoral hernia of the bladder, one of the former containing the entire organ and the prostate as well, which were reduced without injury. The bladder was wounded in the other cases, two being sutured, one of which died. In the third case a ligature was applied and left *in situ*, the wound healing without a sinus, as in Bull's case.

<sup>1</sup> Lyon Médicale, 1895, LXXVIII, p. 239, 281.

TABLE I.—WOUNDS OF THE BLADDER IN OPERATIONS FOR HERNIA.

No.	Operator and Date of Operation.	PATIENT.		HERNIA.			Bladder Wound Recognized.	Bladder mistaken for	TREATMENT.			Catheter & de-meure.	RESULT.		Time and Cause of Death.	Size of Vesical Wound.
		Sex & Age.	Region.	Variety.	Condition.	Other Hern. Complicat.			Bladder Wound.	Hernial Opening.	External Wound.		Bladder.	Duration of Sinus.		
1	Plater. <sup>1</sup> 1575 (?)	M. Adult.	Ing.	. . . .	. . . .	Intest. & omentum.	During operation.	Tumor.	Open.	Open.	Open.	No.	Sinus.	20 yrs.	R.	. . .
2	Mertru. <sup>2</sup>	M. . . .	"	. . . .	Stran.	Intestine.	During operation.	Recognized.	"	. . . .	"	. . .	. . .	. . .	D.	Next day.
3	Guyon. <sup>3</sup> 1750.	M. Adult.	"	. . . .	. . . .	. . . .	During operation.	Abscess or cyst.	"	. . . .	"	Yes.	Sinus.	50 days.	R.	. . .
4	Pott. <sup>4</sup> 1770.	M. 13 yrs.	"	. . . .	Irr.	No other sac.	During operation.	Tumor.	"	. . . .	"	No.	"	14 days.	"	. . .
5	Hedrich. <sup>5</sup> 1890.	M. 56	Ing. R.	Extraperitoneal.	"	Empty sac.	During operation.	Cystic pouch.	Open (drain).	. . . .	"	. . .	"	Until death.	D.	3 weeks.
6	Tilling. <sup>6</sup> 1890.	M. 47	Fem. R.	Extraperitoneal.	Stran.	No other sac.	Next day.	Hernial sac.	Open.	Open.	"	Next day.	"	2 mos.	R.	. . .
7	Pilz. <sup>7</sup> 1891.	M. 62	Ing. R.	Extraperitoneal.	"	No other sac.	During operation.	Fat.	"	"	"	. . .	. . .	. . .	D.	31 hrs anuria.
8	Purcell. <sup>8</sup> 1892.	M. 56	Ing. R.	Extra- and intraperitoneal?	"	Intestine.	During operation.	. . . . .	"	"	"	Yes.	Sinus.	2 mos.	R.	. . .
9	Roux. <sup>9</sup> 1853.	M. 61	Ing. R.	Extraperitoneal.	"	"	When wounded In 7 days.	Degenerated omentum.	Ligature.	"	"	"	. . .	by op.	D.	16 hrs. anuria.
10	Israël. <sup>10</sup> 1882.	M. 51	Ing. R.	. . . .	. . . .	Intest. & omentum.	In 7 days.	Not seen.	"	. . . .	. . . .	No.	Sinus 7 d'ys.	2 mos.	R.	. . .
11	Guelliot. <sup>11</sup> 1889.	M. 60	Ing. L.	Extraperitoneal.	Irr.	Empty sac (?)	In 10 days.	Hernial sac.	"	Sutured.	Sutured (drain).	In 10 days.	Sinus 10 d's.	4 w'ks.	"	. . .
12	(?) <sup>12</sup> 1889.	F. 28	Fem. R.	Extraperitoneal.	Stran.	Omentum.	After operation.	"	"	. . . .	. . . .	Late.	Sinus.	A few days.	"	. . .
13	Reverdin. <sup>13</sup> 1890.	F. 42	Ing. L.	Extraperitoneal.	Irr.	Empty sac.	In 7 days.	"	"	Open.	Sutured (drain).	Yes.	Sinus 7 d'ys.	4 w'ks.	"	. . .
14	Hartley. <sup>14</sup> 1890.	M. 40	Ing. L.	Extraperitoneal.	Stran.	Intest. & omentum.	During operation.	Recognized.	Ligat. ? Sut. in 2 hours.	Sutured.	Sutured.	. . .	. . .	. . .	D.	Shock & hæm'ge. 1/2 inch.
15	Ostermayer. <sup>15</sup> 1892.	M. 60	Ing. R.	Extraperitoneal.	"	Intestine.	After operation.	Fat.	Ligature.	Sutured.	Sutured (drain).	No.	. . .	. . .	"	31 hrs anuria.
16	Jungengel. <sup>16</sup> 1892.	M. 34	Ing. R.	Extraperitoneal.	Not stran.	No other sac.	After operation.	Not recognized.	Ligat. slipped; in 48 h. suture.	. . . .	. . . .	Yes.	Sinus.	Some w'ks.	R.	Admitted 2 fingers.

17	Bull. <sup>17</sup> 1893.	M.	45	Ing. L.	Extraperitoneal.	Irred.	Omentum.	After operation.	Hernial sac.	Ligature.	Sutured.	Sutured, drained.	No.	Prim. union.	. . .	R.	. . .	1 inch long.
18	Michels. <sup>18</sup> 1894.	M.	48	Ing. R.	Extraperitoneal.	Red.	No other sac.	After operation, 24 h's.	"	Ligat. in 24 h. sutured 2 tiers.	Open.	Open.	Yes.	Prim. union.	. . .	"	. . .	
19	Macready. <sup>19</sup>	F.	67	Fem. R.	Extra- and intraperitoneal (?)	Stran.	Intestine.	In 9 days.	"	Ligature.	. . .	. . .	In 9 days.	Sinus.	. . .	"	. . .	
20	Hotchkiss. <sup>20</sup> 1895.	M.	54	Ing. L.	Extraperitoneal.	Red.	Omentum.	In 24 hours.	A second hernial sac.	Ligat. slipped; in 24 h. sutured.	Sutured.	Sutured.	No.	. . .	. . .	D.	9 hours after second op. Shock & hem.	
21	Berger. <sup>21</sup> 1882.	M.	66	Ing. R.	Extra- and intraperitoneal.	. . .	"	In 7 days.	A second hernial sac, then intestine.	Suture, silk, 4 interrupted, 2 purse-string.	. . .	. . .	"	Sinus in 7 d.	Over 3½ m.	R.	. . .	
22	L. Championnière. <sup>22</sup> 1887.	M.	43	Ing. L.	Extraperitoneal.	Stran.	Empty sac.	During operation.	Not seen until wounded.	Sut. catgut, 2 tiers.	Open.	Sutured, drained.	"	Prim. union.	. . .	"	Closed by 8 sut's.	
23	L. Championnière. <sup>23</sup> 1887.	M.	44	Ing. L.	Extraperitoneal.	Irred.	Empty sac.	During operation.	Not seen until wounded.	Sut., catgut, 3 tiers.	"	Sutured, drained.	"	Sinus in 13 days.	5 dy's.	"	Closed by 11 sut's.	
24	Böckel. <sup>24</sup> 1887.	M.	69	Ing. L.	Extra- and intraperitoneal.	. . .	Intestine.	During operation.	Thickening in sac-wall.	Suture.	. . .	. . .	Yes.	. . .	. . .	D.	48 h's anuria.	
25	Socin. <sup>25</sup> 1889.	M.	50	Ing. L.	Extra- and intraperitoneal?	Stran.	"	During operation.	A second hernial sac.	Suture, catgut, 3 tiers.	Open.	Sutured, drained.	No.	Prim. union.	. . .	R.	. . .	
26	Thiriar. <sup>26</sup> 1890.	M.	55	Ing. R.	Extraperitoneal.	Irred.	"	During operation.	Thickening in sac-wall.	Suture, catgut, 2 tiers.	Sutured.	Sutured, drained.	Yes.	Prim. union.	. . .	"	Admitted 1 finger.	
27	Polaillon. <sup>27</sup> 1890.	M.	50	Ing. R.	. . .	. . .	Empty sac.	During operation.	Hernial sac.	Suture.	"	. . .	. . .	. . .	. . .	D.	A few h. shock.	
28	Güterbock. <sup>28</sup> 1891.	F.	32	Fem. R.	Extraperitoneal.	Irred.	Omentum.	During operation.	Intestinal diverticulum.	Sut., silk, 4 interrupted.	Open.	Sutured, drained.	Yes.	Prim. union.	. . .	"	Over 1 ctm. Faecal abscess. Blad. wound healed.	

TABLE I.—WOUNDS OF THE BLADDER IN OPERATIONS FOR HERNIA.—Continued.

No.	Operator and Date of Operation.	PATIENT.		HERNIA.			Bladder Wound Recognized.	Bladder mis-taken for	TREATMENT.			Catheter & <i>de mesure</i> .	RESULT.		Time and Cause of Death.	Size of Vesical Wound.
		Sex & Age.	Re-gion.	Variety.	Condi-tion.	Other Hern. Complicat.			Bladder- Wound.	Hernial Opening.	External Wound.		Blad-der.	Dura-tion of Sinus.	Re-cog-nition.	
29	Postemski. <sup>29</sup> 1891.	M.	Ing.	Extraperi- toneal.	Red.	Hernia.	During operation.	.....	Suture.	Sutured.	.....	.....	.....	.....	R.	.....
30	Weir. <sup>30</sup> 1891.	M.	Ing. L.	Extraperi- toneal.	Red.	Intest. & omentum	During operation.	Fat.	Sut., cat-gut m.; silk outside.	"Mac-ewen."	Sutured, drained.	Yes.	Sinus.	4 w'ks.	"	Admit- ted I finger.
31	Lejars. <sup>31</sup> 1891.	F.	Ing. R.	Extra- and intrapari- toneal.	Stran.	Fallopian tube.	During operation.	Thickening in sac-wall.	Sut., cat-gut m.; silk outside;	Sutured?	Sutured, drained.	"	"	4½ mos.	"	Admit- ted I finger.
32	Justo. <sup>32</sup> 1892.	M.	Ing. R.	Extraperi- toneal.	Red.	Empty sac.	During operation.	Tumor (injec-tion failed).	Sut., silk 3 tiers.	.....	Sutured, drained.	No.	Prim. union.	.....	"	8-9 m.m.
33	Roth. <sup>33</sup> 1892.	M.	Vent. near R. ext.	Extraperi- toneal.	Stran.	Empty inguinal sac.	During operation.	Not seen until wounded.	"Lem-bert silk sutures.	Open.	Open.	Yes.	Prim. union.	.....	"	3 cm.
34	Lanz. <sup>34</sup> 1892.	F.	Fem. R.	Extra- and intrapari- toneal.	"	Intestine.	During operation.	Suspected.	Contin. silk sut. through all layers.	Sutured.	Sutured, drained.	No.	Prim. union.	.....	"	Admit- ted I finger.
35	Mandry. <sup>35</sup> 1893.	M.	Ing. L.	Extra- and intrapari- toneal?	"	"	During operation.	A second her-nial sac.	Suture, 3 tiers, cat-gut, con-tinuous.	Open.	Sutured, drained.	Yes.	Prim. union.	.....	"	2 cm.
36	Rose. <sup>36</sup> 1893.	F.	Ing. L.	Extraperi- toneal.	Red.	Omentum.	During operation.	Hernial sac.	Suture, 2 tiers, cat-gut.	Sutured.	Sutured, drained.	"	Prim. union.	.....	"	Small.
37	Gerster. <sup>37</sup> 1893.	M.	Ing. L.	Extraperi- toneal.	Stran.	Intestine.	During operation.	Fat.	Suture, 3 tiers, cat-gut.	Open.	Sutured, drained.	No.	Prim. union.	.....	"	Admit- ted I finger.



38	Gerster. <sup>38</sup> 1893.	M.	47	Ing. L.	Extraperi- toneal.	Stran.	Intestine.	During operation.	Recognized.	Suture, 3 tiers, cat- gut.	Open.	Sutured, drained.	Yes.	Sinus.	4 wks.	R.	Small.
39	Curtis. <sup>39</sup> 1893.	M.	62	Ing. R.	Extra- and intrapari- toneal.	Red.	Intest. & omentum.	During operation.	A second her- nial sac (hy- drocele).	Sut., silk, 3 tiers.	Sutured. "Mac- ewen."	Sutured, drained.	No.	Prim. union.	...	"	Admit- ted I finger.
40	Simson. <sup>40</sup> 1894.	M.	70	Ing. L.	Extraperi- toneal.	Irred.	Sigmoid flexure.	During operation.	Not seen until wounded.	Suture, 1 stitch.	Sutured.	Sutured, drained.	"	...	...	D.	48 h's. Not fr'm bladder- wound.
41	Lane. <sup>41</sup> 1894.	M.	51	Ing. L.	Extraperi- toneal.	"	Intest. & omentum.	During operation.	Recognized.	Sut'd, 2 tiers after resect'n.	"	...	...	...	...	(?)	Admit- ted I finger.

Also the two cases of Kestley and Halsted related in the text.

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- 41 Lane, Lancet, 1894, 1, 1186.

TABLE II.—BLADDER REDUCED WITHOUT INJURY.

No.	Reference.	Operator and Date of Operation.	PATIENT.		HERNIA.			Complicating Hernia.	Bladder Recognized.	Means of Diagnosis.	Recovered or Died.	Remarks.
			Sex.	Age, Years.	Region.	Variety.	Condi- tion.					
1	Maurain, Verdier, Mém. Acad. roy. de Chir., II, p. 19.	Renard. 1769.	M.	80	Ing. L.	. . . . .	Stran.	Intestine.	Before opera- tion.	Symptoms.	D.	
2	Scott, Med. and Surg. Rep., Philadelphia, July 25, 1868.	Scott. 1868.	F.	Adult.	Ing. R.	Intraperito'l.	"	No other sac.	During opera- tion.	Sound in blad- der.	R.	
3	Krönlein, Arch. für klin. Chir., XIX, 420.	Krönlein. 1876.	M.	40	Ing.	"	"	Intestine.	During opera- tion.	Injection. Muscle.	D.	From chloroform given 48 hours after operation for intestinal puncture. Lung complication.
4	Monod and Delagènière, Rev. de Chir., Sept., 1889, p. 701.	Monod & Dela- génère. 1889.	M.	53	Ing. L.	Extraperito'l.	Irred.	No other sac.	During opera- tion.	Pedicle led to bladder.	"	
5	Böckel, Gaz. méd. de Stras- bourg, 1890 No. 2 (cited by Mandry).	Böckel. 1889.	M.	55	"	Extra- & in- traperitoneal.	"	Intestine.	During opera- tion.	Injection. Muscle.	R.	
6	Bourbon, Thèse de Paris (cited by Lejars and Mandry).	Walther. 1892.	M.	59	Ing. R.	Intraperito'l.	Stran.	"	During opera- tion.	Pedicle.	"	
7	Bourbon, Thèse de Paris (cited by Lejars and Mandry).	Walther. 1892.	. . . . .	. . .	Ing.	"	"	. . . . .	During opera- tion.	Sound.	. . .	
8	Kümmer, Rev. méd. de la Suisse rom., 1892, No. 4, p. 235.	Kümmer. 1892.	M.	5	Ing. R.	Extra- & in- traperitoneal.	Red.	Omentum.	During opera- tion.	Pedicle. Sound.	R.	Previous "radi- cal" operation.
9	Roth, Deutsche medicinische Wochenschrift, 1892, 537.	Von Bergmann. 1892.	M.	48	Ventr'l near R. ext. ring.	Extraperito'l	Irred.	No other sac.	During opera- tion.	Sound.	"	
10	Roth, Deutsche medicinische Wochenschrift, 1892, 537.	Roth. 1892.	F.	52	Ing. L.	Extraperito'l?	"	"	Before opera- tion.	"	"	Previous "radi- cal" operation.
11	Lanz, Berliner klin. Wochen- schrift, 1892, 742.	Lanz. 1892.	F.	48	Fem. R.	Extra- & In- traperitoneal.	Red.	Empty sac.	During opera- tion.	Pedicle. Sound.	"	Previous "radi- cal" operation.
12	Ostermayer, Deutsche Zeitschr. für Chirurgie, XXXIX, 137.	Ostermayer. 1893.	M.	32	Ventr'l near R. ext. ring.	Extraperito'l.	"	No other sac.	During opera- tion.	Sound.	"	

TABLE II.—BLADDER REDUCED WITHOUT INJURY.—Concluded.

No.	Reference.	Operator and Date of Operation.	PATIENT.		HERNIA.			Complicating Hernia.	Bladder Recognized.	Means of Diagnosis.	Recovered or Died.	Remarks.	
			Sex.	Age, Years.	Region.	Variety.	Condi- tion.						
13	Ostermayer, Deutsche Zeitschr. für Chirurgie, xxxix, 137.	Ostermayer. 1893.	F.	43	Ing. R.	Extraperito'l.	Red.	Intestine and omentum. No other sac.	During opera- tion.	Pedicle.	R.		
14	Schoonen, Rev. de Chir., 1893, p. 331.	Schoonen. 1893.	M.	Adult.	Fem.	"	Stran.		During opera- tion.	Pedicle.	Sound.	"	
15	Reverdin, Rev. méd. de la Suisse rom., August 20, 1894, p. 470.	Reverdin. 1893.	M.	60	Ing. R.	Extra- & in- traperitoneal.	"		Intestine.	During opera- tion.	Sound. Muscle.	"	
16	Arch. prov. de Chir., October, 1894 (cited by Ann. mal. org. gen. urin., January, 1895).	Delagènière. 1893.	M.	54	"	Extra- & in- traperitoneal.	"	"	Before opera- tion.	Symptoms.	"		
17	Reymond, Bull. Soc. Anat. de Paris, November, December, 1894, p. 842.	Reymond. 1894.	F.	38	Ing. L.	Extra- & in- traperitoneal?	Irred.	Intestine, ovary, and tube.	During opera- tion.	Pedicle.	"		